Claims

[c1] 1.A method of forming a bump on a wafer, wherein the wafer has an active surface, and the active surface is provided with a passivation layer and a bonding pad exposed by the passivation layer, the method comprising:
forming an adhesive layer on the active surface of the wafer to cover the bonding pad and the passivation layer;
forming a barrier layer on the adhesive layer;
forming a wettable layer on the barrier layer;
forming a photomask on the wettable layer by a photolithography process, wherein the photomask exposes a portion of the wettable layer;
removing the exposed wettable and sequentially the barrier layer and the adhesive layer thereunder by etching, until the active surface of the wafer is exposed;
removing the photomask;
bonding a conductive stud onto the wettable layer, wherein the conductive stud is made of a material selected from tin/lead alloy, leadless alloy and pure tin; and
performing a reflow process to form a ball-shaped bump.

[c2] 2.The method of claim 1, wherein the adhesive layer is formed of titanium, titanium tungsten alloy, aluminum and chromium.

[c3] 3.The method of claim 1, wherein the barrier layer is formed of a material selected from a group consisting of nickel vanadium alloy, chromium copper alloy, and nickel.

[c4] 4.The method of claim 1, wherein the wettable layer is formed of a material selected from a group consisting of copper, palladium, and gold.

[c5] 5.The method of claim 1, wherein the conductive stud is formed of a material selected from tin lead alloy with high lead percentage of more than 90%.

[c6] 6.The method of claim 1 wherein the conductive stud is formed of a material selected from tin copper alloy, tin silver alloy, tin magnesium alloy, tin zinc alloy, indium silver alloy, tin bismuth alloy, tin indium alloy, and bismuth indium

alloy.

[c7] 7.The method of claim 1, wherein the conductive stud has a top surface and a bottom surface opposite to the top surface, the bottom surface being in contact with the wettable layer and the top surface being flattened by polishing before reflow.

[c8] 8.The method of claim 1, wherein the step of bonding the conductive stud onto the wettable layer comprises:
providing a wire;
melting one tip end of the wire to form a ball;
pressing the ball onto the wettable layer; and
separating the ball from the wire to form the conductive stud on the wettable layer.

[c9] 9.The method of claim 8, wherein the ball is pressed onto the wettable layer while applying ultrasonic wave.

[c10] 10.A method of forming a bump on an active surface of a wafer, the method comprising:
forming an under ball metallurgy (UBM) on the active surface of the wafer;
forming a photomask on the UBM by photolithography to partially expose the UBM;
removing the exposed portion of the UBM by etching, until the active surface of the wafer is exposed;
removing the photomask;
bonding a conductive stud onto the UBM; and
performing a reflow process to form a ball-shaped bump.

[c11] 11.The method of claim 10, wherein the step of bonding the UBM onto the active surface of the wafer comprises:
forming an adhesive layer on the active surface of the wafer;
forming a barrier layer on the adhesive layer; and
forming a wettable layer on the barrier layer.

[c12] 12.The method of claim 11, wherein the adhesive layer is formed of a material

selected from a group of titanium, titanium tungsten alloy, aluminum, and chromium.

[c13] 13.The method of claim 11, wherein the barrier layer is formed from a material selected from a group consisting of nickel vanadium alloy, chromium copper alloy, and nickel.

[c14] 14.The method of claim 11, wherein the wettable layer is formed of a material selected from a group consisting of copper, palladium, and gold.

[c15] 15.The method of claim 10, wherein the conductive stud is formed of leadless alloy.

[c16] 16.The method of claim 10, wherein the conductive stud is formed of a material selected from a group consisting of tin copper alloy, tin silver alloy, tin magnesium alloy, tin zinc alloy, indium silver alloy, tin bismuth alloy, tin indium alloy, bismuth indium alloy, and tin.

[c17] 17.The method of claim 10, wherein the conductive stud is formed of tin lead alloy.

[c18] 18.The method of claim 10, wherein the conductive stud is formed of tin lead alloy with high lead percentage of more than 90%.

[c19] 19.The method of claim 10, wherein the conductive stud has a top surface and a bottom surface opposite to the top surface, the bottom surface being in contact with the wettable layer and the top surface is flattened by polishing before reflow.

[c20] 20.The method of claim 10, wherein the step of bonding the conductive stud onto the wettable layer comprises:
providing a wire;
melting one tip end of the wire to form a ball;
pressing the ball onto the wettable layer; and
separating the ball from the wire to form the conductive stud on the wettable layer.

[c21] 21.The method of claim 20, wherein the ball is pressed onto the wettable layer while applying ultrasonic wave.

[c22] 22.A method of forming a bump on an active surface of a wafer, the method comprising:
forming a UBM on the active surface of the wafer;
partially removing the UBM, until the active surface of the wafer is exposed; and
bonding a conductive stud onto the UBM.

[c23] 23.The method of claim 22, further comprising a step of performing a reflow process to shape the conductive stud in the form of ball after bonding a conductive stud onto the UBM.

[c24] 24.The method of claim 22, wherein the step of forming the UBM on the active surface of the wafer comprises:
forming an adhesive layer on the active surface of the wafer;
forming a barrier layer on the adhesive layer; and
forming a wettable layer on the barrier layer.

[c25] 25.The method of claim 24, wherein the adhesive layer is formed of a material selected from a group of titanium, titanium tungsten alloy, aluminum, and chromium.

[c26] 26.The method of claim 24, wherein the barrier layer is formed of a material selected from a group consisting of nickel vanadium alloy, chromium copper alloy, and nickel.

[c27] 27.The method of claim 24, wherein the wettable layer is formed of a material selected from a group consisting of copper, palladium, and gold.

[c28] 28.The method of claim 22, wherein the conductive stud is formed of leadless alloy.

[c29] 29.The method of claim 22, wherein the conductive stud is formed of a material selected from a group consisting of tin copper alloy, tin silver alloy, tin magnesium alloy, tin zinc alloy, indium silver alloy, tin bismuth alloy, tin indium alloy, bismuth indium alloy, and tin.

[c30] 30.The method of claim 22, wherein the conductive stud is formed of tin lead alloy.

[c31] 31.The method of claim 22, wherein the conductive stud is formed of tin lead alloy with high lead percentage of more than 90%.

[c32] 32.The method of claim 22, wherein the conductive stud has a top surface and a bottom surface opposite to the top surface, the bottom surface being in contact with the wettable layer and the top surface is flattened by polishing after the conductive stud is bonded onto the UBM.

[c33] 33.A method of forming a bump on a UBM that has been formed on an active surface of a wafer, the method comprising:
bonding a conductive stud on the UBM by wire bonding.

[c34] 34.The method of claim 33, further comprising a step of reflow to form a ball-shaped bump after the conductive stud is bonded onto the UBM.

[c35] 35.The method of claim 33, further comprising a step of flattening the conductive stud after the conductive stud is bonded onto the UBM.

[c36] 36.The method of claim 35, wherein flattening the conductive stud is achieved by polishing.

[c37] 37.The method of claim 33, wherein the step of bonding the conductive stud onto the UBM comprises:
providing a wire;
melting a tip end of the wire to form a ball;
pressing the ball onto the UBM; and
separating the ball from the wire to form a bump on the UBM.

[c38] 38.The method of claim 37, wherein the ball is pressed onto the UBM while applying an ultrasonic wave.